

Natural Conditions

## 2.0 ENVIRONMENTAL SETTING - NATURAL CONDITIONS

### 2.1 CLIMATE

The climate at Fort Irwin is moderate desert. Precipitation averages 1.5 inches annually. Occasionally there are summer showers and thunderstorms which produce flash flooding, but these are rare.

During the winter, strong turbulent winds may occur. Local dust storms often accompany the strong winds.

### 2.2 AIR QUALITY

Fort Irwin is in the Southeast Desert Air Basin. The basin has been designated as a non-attainment area for photochemical oxidants and total suspended particulates.

It is believed that the existing oxidant problem in the Southeast Desert Air Basin may be due, in part at least, to the transport of ozone and precursor species from the heavily populated South Coast Air Basin. In October 1978, the Southern California Association of Governments and the South Coast Air Quality Management District jointly issued the draft Air Quality Management Plan for the South Coast Air Basin. This plan calls for a wide range of emissions control strategies designed to improve air quality in the Basin.

High total suspended particulate (TSP) concentrations are related largely to the effects of wind on the dry desert surface. At Barstow, the nearest air quality monitoring site, federal primary standards were exceeded on 54 days in 1977. State standards were exceeded on 42 days for oxidant, one day for nitrogen dioxide, and 39 days for total suspended particulates.








### 2.3 PHYSIOGRAPHY

#### 2.3.1 General

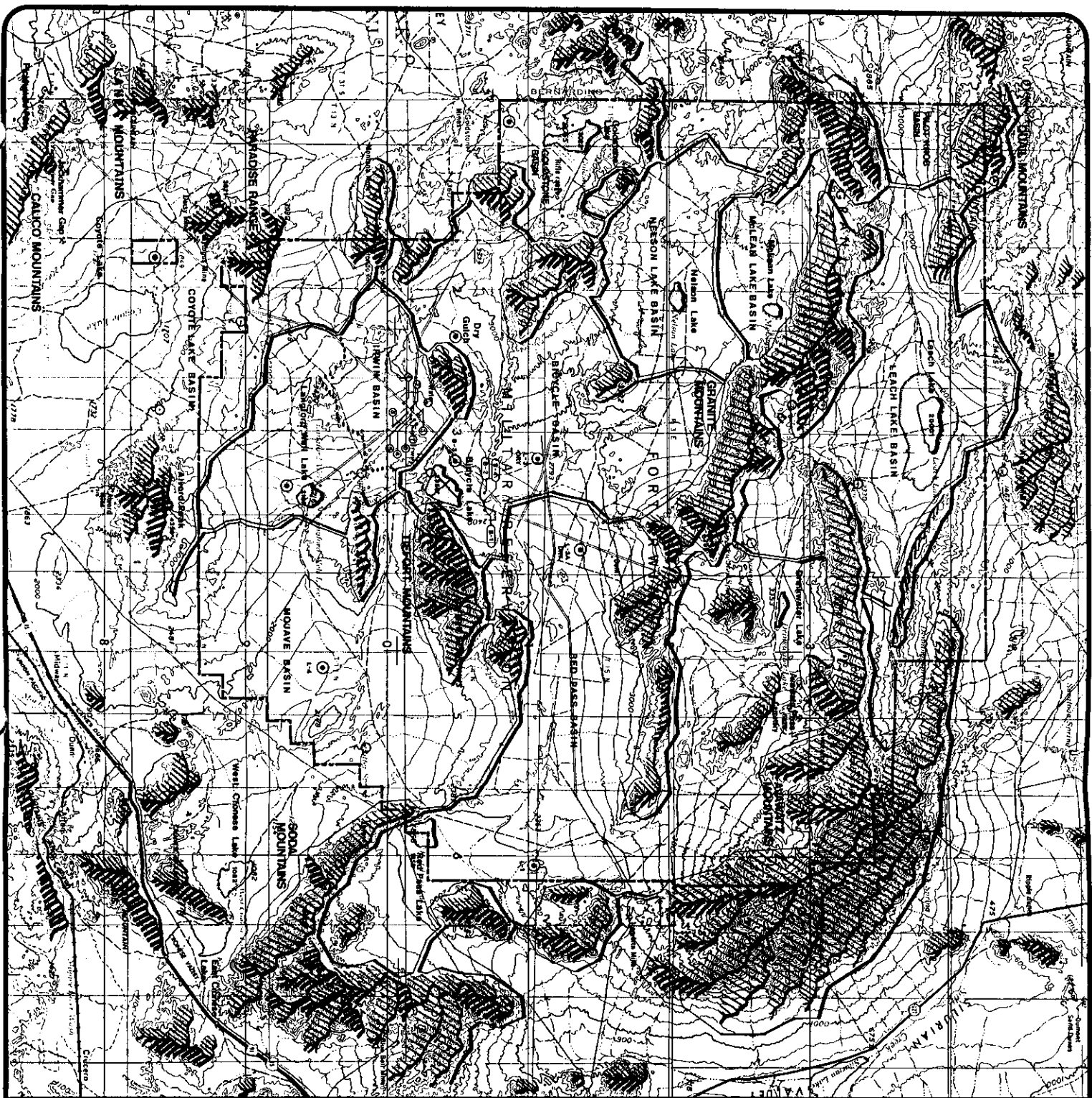
Figure 3 illustrates the physiography and hydrology of the Fort Irwin Reservation. Fort Irwin is at the northern edge of the Mojave Desert Geomorphic Province, dominated by broad alluviated basins. Remnant peaks rise above the alluvial fill of the valleys, and intermittent lakes are found in nearly every internal drainage system.

# Physiography and Hydrology

FIGURE 3

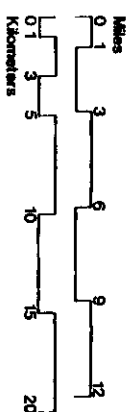
-  Active well  
(see text for explanation)
-  Well of unknown status
-  Exploratory well  
(see text for explanation)
-  Spring
-  Surface drainage basin
-  Ground water basin divide  
Fort Irwin basin area
-  Mountain ranges

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### 2.3.2 Relief

Elevations in the Fort Irwin Reservation range from 1,876 meters (6,154 feet) in the Avawatz Mountains to 518 meters (1,700 feet) near Bitter Springs. Elevations on the site are generally higher than those to the north and east.

### 2.3.3 Slope

The topography of Fort Irwin can be divided into four classes, based upon slope: flat; gently rolling; hilly; and mountainous. Approximately half of Fort Irwin's area is flat. The Fort Irwin terrain is fully trafficable by foot troops, 50 percent trafficable by wheeled vehicles and 60 percent trafficable by tracked vehicles.

## 2.4 HYDROLOGY

### 2.4.1 Water Supply

Wells, springs, and surface drainage basins on the reservation are identified in Figure 3.

#### A. Surface Water Resources

There are no permanent streams at the Fort Irwin Military Reservation. Surface water flow occurs only after intense rainfall periods, and the water soon infiltrates the dry desert soils or evaporates. Some water reaches playas (dry lake beds) which become inundated for short periods. This intermittent water supply is inappropriate for domestic use due to its high levels of suspended and dissolved solids and high salt concentrations.

Springs occur at a few isolated spots on the reservation and in the immediate vicinity. Several springs on the base were developed in 1944, and substantial underground storage was provided in redwood tanks.

#### B. Subsurface Water Resources

The Fort Irwin Military Reservation obtains all of its water from eleven wells located within the reservation area. Eight wells which generate about one-half of the water used at Fort Irwin are located within the main cantonment area. Three wells are located in the vicinity of Bicycle Lake. The static water level in all active wells within the reservation has dropped significantly since they were drilled.

Groundwater occurs principally in alluvial deposits underlying the valleys and basins within the reservation. Recharge

of the Irwin and Bicycle Lakes Basins, from which water is mined, is by that precipitation which is not lost through evaporation, transpiration, or surface runoff. Combined recharge for the two basins is estimated to be 266.7 million gallons (818 acre-feet) per year, while the combined basin yields are estimated to be 86,968 million gallons (266,855 acre-feet) per year.

Of several groundwater basins explored as additional water sources for Fort Irwin, only, two, Langford Lake and Coyote Lake, have been shown to have realistic potential.

#### 2.4.2 Water Use

Water use on the Fort Irwin Reservation has varied significantly since the base was first opened. 1974 records show that 4591 million gallons of water had been extracted from the Irwin basin since 1956, and the water table had dropped about 15 feet. Water pumped in 10 months of 1976 amounted to 178 million gallons (546 acre-feet). The present rate of pumpage is about 144 million gallons (442 acre-feet) per year.

#### 2.4.3 Water Quality

In general, water from wells and springs within the reservation is potable, although generally high in flourides and occasionally high in iron, boron, and nitrates. Water from all wells is chlorinated and goes to a storage and distribution system. Water consumed in the main housing area passes through a flouride treatment plant to reduce fluoride content to acceptable limits. Non-potable groundwater is used for irrigation, to wash equipment, in water evaporators and for shower stalls.

Chemical analyses of well water samples taken in 1973 and 1974 are included in Appendix A.

#### 2.4.4 Sewage Treatment and Disposal

Sewage produced at the main cantonment area is treated at a primary treatment plant designed to support a population of 10,000 people on a daily basis. The facilities consist of a collection system which conveys the sewage to two primary clarifiers, a single-staged heated digester, and a grease pit. Solids are conveyed to a sludge drying area and the liquid effluent to five oxidant ponds. Effluent in the oxidation ponds does not currently overflow and is eliminated entirely by natural evaporation.

## 2.5 SURFICIAL GEOLOGY

### 2.5.1 General

The Mojave Desert is a Cenozoic feature formed as early as the Oligocene Epoch, 40 million years ago, presumably from movements related to the San Andreas and Garlock fault. Fort Irwin contains numerous depositional basins between mountains.

Figure 4 illustrates the surficial geology of the Fort Irwin reservation. Fort Irwin's mountain blocks, the Tiefort Mountains and Granite Mountains, are primarily granite intrusives. The Avawatz Mountains are composed primarily of Precambrian metamorphic rocks older than 600 million years.

There are some volcanics and intrusives of Tertiary Age (1 to 70 million years), to the west of the cantonment area toward Goldstone Lake and extending westward and into the Naval Weapons Center. The volcanics include basalt flows, andesites, pyroclastics (volcanic tuff and breccia), plugs and dikes.

### 2.5.2 Faulting

The Garlock fault, which crosses the northern portion of Fort Irwin, forms the northern boundary of the Mojave Desert. The Garlock fault is the second largest fault in the state, extending some 150 miles. The fault exhibits left-lateral displacement which has been estimated at 80 meters during Holocene time (the past 10 thousand years). Other fault traces on Fort Irwin show parallelism with the Garlock fault.

### 2.5.3 Seismicity

Fort Irwin is rated as Zone 3 in seismic risk, which is defined as a zone susceptible to damage corresponding to Modified Mercalli (MW), Intensity VIII or greater.

- o Intensity VIII, Modified Mercalli Scale:      General  
fright, and alarm approaches panic. Persons driving cars are disturbed. Trees shake strongly . . . Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters vary. Damage . . . considerable in ordinary substantial buildings. . . Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

The California Division of Mines and Geology map of Earthquake Intensities shows Fort Irwin in an area that has experienced earthquake intensities of VI, VII, or VIII one to five times from 1810 to 1969.

## 2.6 SOILS

Approximately 40 percent of the total area of the Fort Irwin Military Reservation is underlain by alluvial and lacustrine deposits. The remaining 60 percent of the area is underlain by bedrock, at or near the surface.

Three soil types predominate on the Fort Irwin Reservation. The soil derived from granitic rocks is a silty sandy gravel. That derived from decomposing volcanic rocks is a silty gravel. The older, dissected alluvial deposits and terrace gravels are very rocky soils. Both the volcanic and granitic derived soils have medium to low permeability.



Desert pavement, a residual layer of large soil particles left on the ground surface after the finer particles have been carried off by wind and water, and agal and chemical crusts are developed over virtually all soil surfaces. This layer, also called desert armor, protects the desert surface against erosion. The lag gravels that make up the desert armor are often brightly polished from coatings of oxide of iron and manganese, giving a shiny appearance known as desert varnish.

## 2.7 VEGETATION

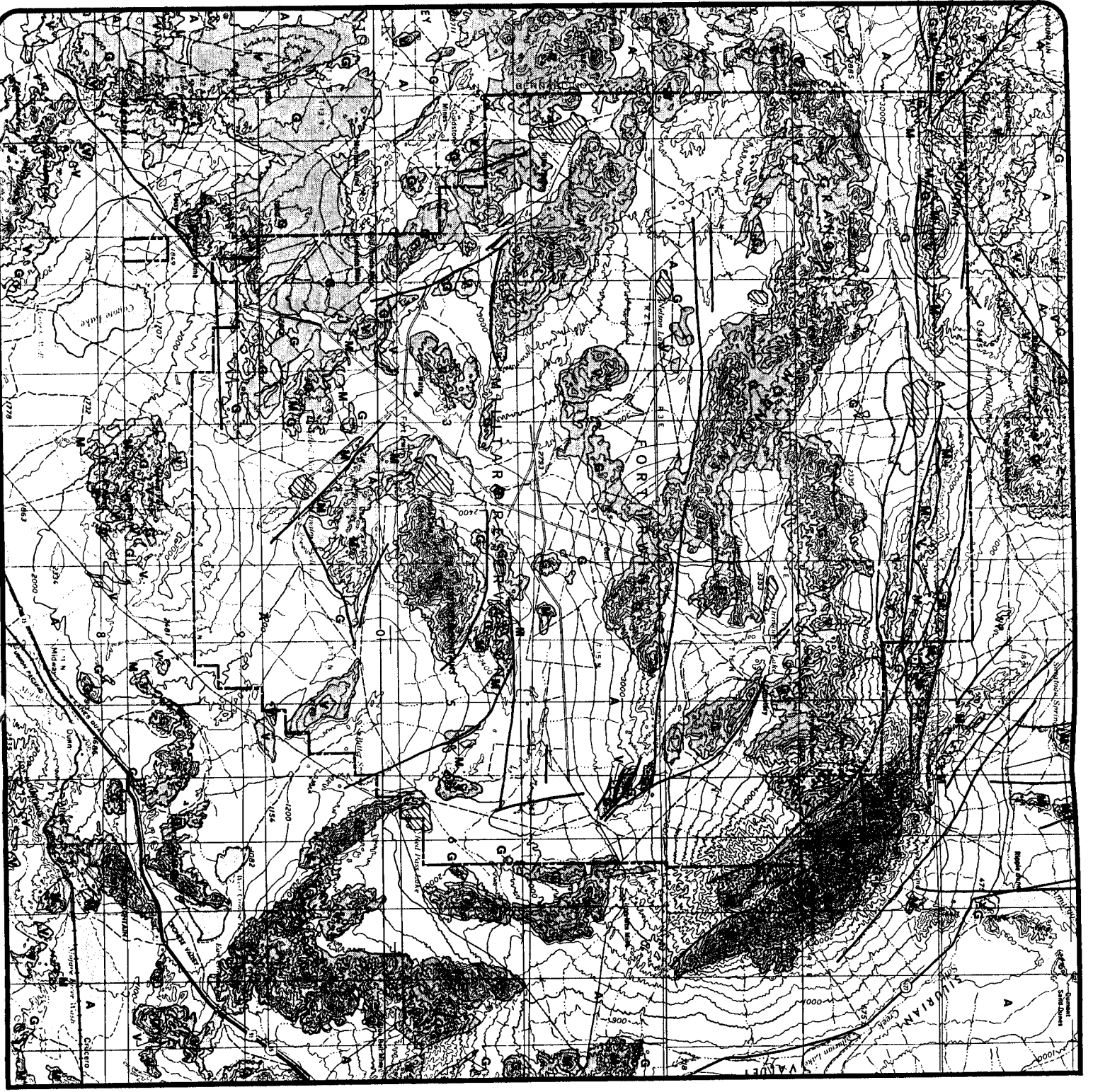
### 2.7.1 Plant Communities

Four distinct plant communities are present on the Fort Irwin base. These are depicted in Figure 5, below. The dominant community, covering 85 percent of Fort Irwin, is the Creosote Bush Scrub Community, which provides a sparse vegetative cover of predominantly Creosote Bush and Burrobush. Vegetation on the remaining 15 percent of the base varies from the Joshua Tree Woodland and Shadscale Scrub Communities at higher elevations, to the Alkali Sink Community in poorly-drained alkaline flats. Appendix A provides a detailed presentation of the four plant communities, as well as a plant species listing generated from a 1975 study along Fort Irwin's northern boundary.

# Surficial Geology

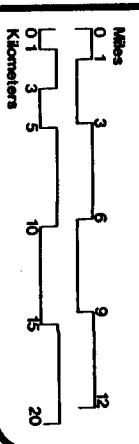
- M** Metamorphic and Sedimentary Rock
- V** Volcanic Rock
- G** Granitic Rock
- A** Alluvium
-  Fault
-  Dry Lake Bed (Playa)

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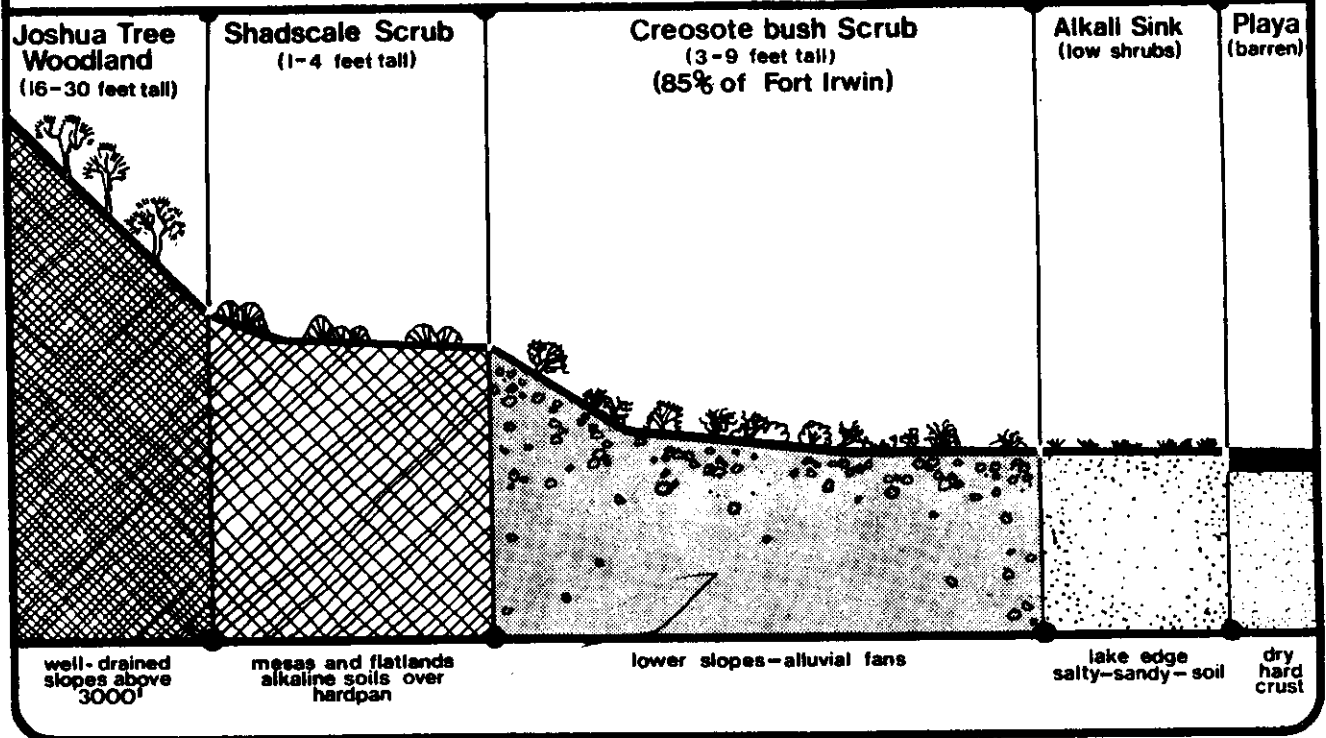
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## Plant Communities

Figure 5



### 2.7.2 Rare Plant Species

Within the Creosote Bush Communities, three rare wild flower species occur: Mojave indigo bush (*Dalea arborescens*); lax-flowered locoweed; and devil's cactus (see Figure A-2, p. A-27). Field studies along the western boundary of Fort Irwin resulted in the identification of numerous Mojave indigo bush plants. The plants were sighted immediately outside the boundaries of the Fort. The species has been proposed for federal threatened species status by the Smithsonian and the California Native Plant Society.

## 2.8 WILDLIFE

### 2.8.1 General

The principal vertebrate species in the Fort Irwin area are rodents, reptiles and birds. Some large mammals are also known to frequent the reservation, including the Desert Bighorn Sheep, coyote, bobcat, kit fox and badger. Appendix A includes a discussion of species known or expected to inhabit the area.

## 2.8.2 Protected, Rare, and Endangered Species

Rare and endangered species of wildlife are those forms which have been nearly exterminated or are continually threatened by human population increases and associated pressures. A number of species may be present in low numbers on the Fort Irwin reservation because, although they may be abundant in more favorable habitats, the region is at the limit of their range. Some species normally maintain sparse populations because of their unique life cycles, habitat, and dependency on other natural factors. Other species normally maintain higher population levels and would be widespread in the region were not their numbers drastically reduced by overharvest, diminished size and quality of habitat, competition with introduced species, or some combination of these and other causes. Species of undetermined status are those which one or more state or federal agency considers unusual or threatened on a local scale, but which are not necessarily rare or endangered on a wider geographic scale. Protected species are those that are fully protected under California law, but which may not presently be considered rare and endangered.

The following rare and endangered or protected species are expected to inhabit the Fort Irwin Reservation:

- o Desert kit fox  
(*Vulpes macrotis*)
- o Mojave ground squirrel  
(*Spermophilus mohavensis*)
- o Prairie falcon  
(*Falco mexicanus*)
- o Burrowing owl  
(*Speotyto cunicularia*)
- o Desert tortoise  
(*Gopherus agassizi*)
- o Desert-horned lizard  
(*Phrynosoma platyrhinos*)
- o Banded gecko  
(*Coleonyx variegatus*)

The Desert Kit Fox, designated a protected species by the State of California is expected to inhabit Fort Irwin, but has not been officially sighted.

The only known populations of the Mojave ground squirrel, protected by the State of California as a rare species, exist in the Victorville, Barstow, China Lake and Fort Irwin regions of the Mojave Desert. The Mojave ground squirrel occurs within the range of the antelope ground squirrel, but they have different activity patterns which minimize competition between the two species. Mojave ground squirrels were observed at four locations in Fort Irwin in 1977 (Wessman, 1977). The Mojave ground squirrel inhabits the scattered brush of this desert region, preferring areas of sandy or gravelly soil. Accelerated urbanization and land use changes taking place in the Mojave River Basin and Antelope Valley are destroying much of its habitat. Capture, possession, or sale of this animal is prohibited by the State of California.

Prairie falcons (Falco mexicanus) observed on or near Fort Irwin in 1975 frequent many habitats such as canyons, plains, deserts, and open mountain areas. They nest in bare niches of cliffs and do not tolerate any disturbance within their nesting range.

The burrowing owl is commonly found year-round at Fort Irwin. Although not officially designated as a rare and endangered or protected species, the burrowing owl is on the Audubon Society Blue List of diminishing species.

The desert tortoise, designated as California's state reptile, is protected by the State of California though it is not yet considered a rare or endangered species. Increasing recreational use of its western desert habitat has resulted in a severe decline in population size. One desert tortoise and several shells have been sighted on or near Fort Irwin.

Two species, the desert-horned lizard and the banded gecko, are listed as "status undetermined" by the Bureau of Land Management.

None of the above species are currently protected under federal law. It is expected that the Bureau of Land Management will soon propose that the desert tortoise be listed as a federal threatened species.

#### 2.8.3 Wildlife Management Plan For Fort Irwin

In 1964, a Cooperative Plan for the Conservation and Development of Wildlife on the Fort Irwin Military Reservation was made between the California Department of Fish and Game, the U.S. Bureau of Sport Fisheries and Wildlife, and the commanding officer at Fort Irwin. Subsequently, a Wildlife Management Plan was prepared by the California Department of Fish

and Game. The principal actions under this plan have been the preservation of twelve springs for wildlife habitat enhancement and the installation of six guzzlers (wildlife water devices) at sites on the reservation where there would be no interference with military exercises. California Department of Fish and Game biologists tour the springs on Fort Irwin on an annual basis to clean them out, improve water flow and observe usage by animals.

## 2.9 NOISE

The general perception of the desert's noises is that of silence. Desert sounds typically represent the antithesis of the noise environment of urban life. This silence, which adds to the feeling of solitude natural to the lands and spaces of Fort Irwin, has been interrupted over the years with each military training exercise conducted on the base. The major forms of interruption have included ground maneuvers by Army tactical vehicles, weapons artillery firing, air operations including supersonic activities, air to ground gunnery exercises, and a general increase in supply and transportation channels to Fort Irwin during such exercises. Appendix A includes a scale of noise levels for various activities, as well as a discussion of the San Bernardino County noise quality standards.

## 2.10 ARCHAEOLOGIC AND HISTORIC RESOURCES

An abundance of archaeologic and historic resources exists in the Mojave Desert, and especially within the boundary of Fort Irwin. Only a few archaeologic sites, however, have been discovered and recorded, as access to the base is controlled. These are shown in Figure 6.

Fort Irwin's archaeologic resources generally consist of open habitation, rock shelter and quarry sites, all with a strong potential for the existence of petroglyphs, trails, rock alignments, etc. Some known sites include lithic assemblages thought to be older than ten thousand years. The artifacts typically found consist of choppers, flake scrapers, and bifacially flaked "coup de point-like" implements similar to those of the Old World lower paeolithic period.

## 2.11 POPULATION AND DEMOGRAPHIC CHARACTERISTICS OF BASE PERSONNEL

### 2.11.1 Permanent Post Population

The permanent party stationed at Fort Irwin consists of a National Guard headquarters unit with an authorization for 52 personnel, the Mobilization and Training Equipment Site (MATES) with 147 personnel, most of whom live off base, and three people who administer the post exchange club system facilities.

Twenty-two employees with 77 dependents live on the base. During annual training exercises for the National Guard, this full-time staff is augmented with temporary personnel.

### 2.11.2 Transient Use

Between 400 and 2,000 Army Reserve and National Guard personnel currently use Fort Irwin on each of 36 training weekends each year. During annual training, approximately 12,000 to 15,000 troops rotate through Fort Irwin in five training sessions. These usually occur during the summer months and last for two weeks each.

The active Army intermittently uses the Fort for armored exercises.





Cultural and  
Socioeconomic Conditions

## 2.12 LAND USE

### 2.12.1 Fort Irwin

#### A. History

Since its opening in 1940, Fort Irwin has trained military personnel for three wars, has been deactivated twice, and has had three name changes. Originally conceived as the Mojave Anti-Aircraft Range, it later became, because of its physiography, an armor and desert training center. It has been in various levels of use for 29 of the last 37 years. Roughly half of the 1,006 structures on the base are of World War II construction. The latest partial inactivation occurred beginning January, 1971, when the U.S. Sixth Army, for budgeting concerns, deactivated the post to a maintenance status. Full responsibility for the operation of the post was assumed by the State of California on September 1, 1972.

#### B. Land Utilization

Land ownership and infrastructure are depicted in Figure 7.

##### (1) General

The Fort consists of 642,582 acres of land, just a little over 1,000 square miles. All portions of the installation are utilized, with roughly 85% of the acreage serving as maneuver areas for training operations, buffer safety zones, or artillery impact areas.

Several government and private organizations maintain formal use agreements with the Army for various land-related activities.

##### (2) Facilities

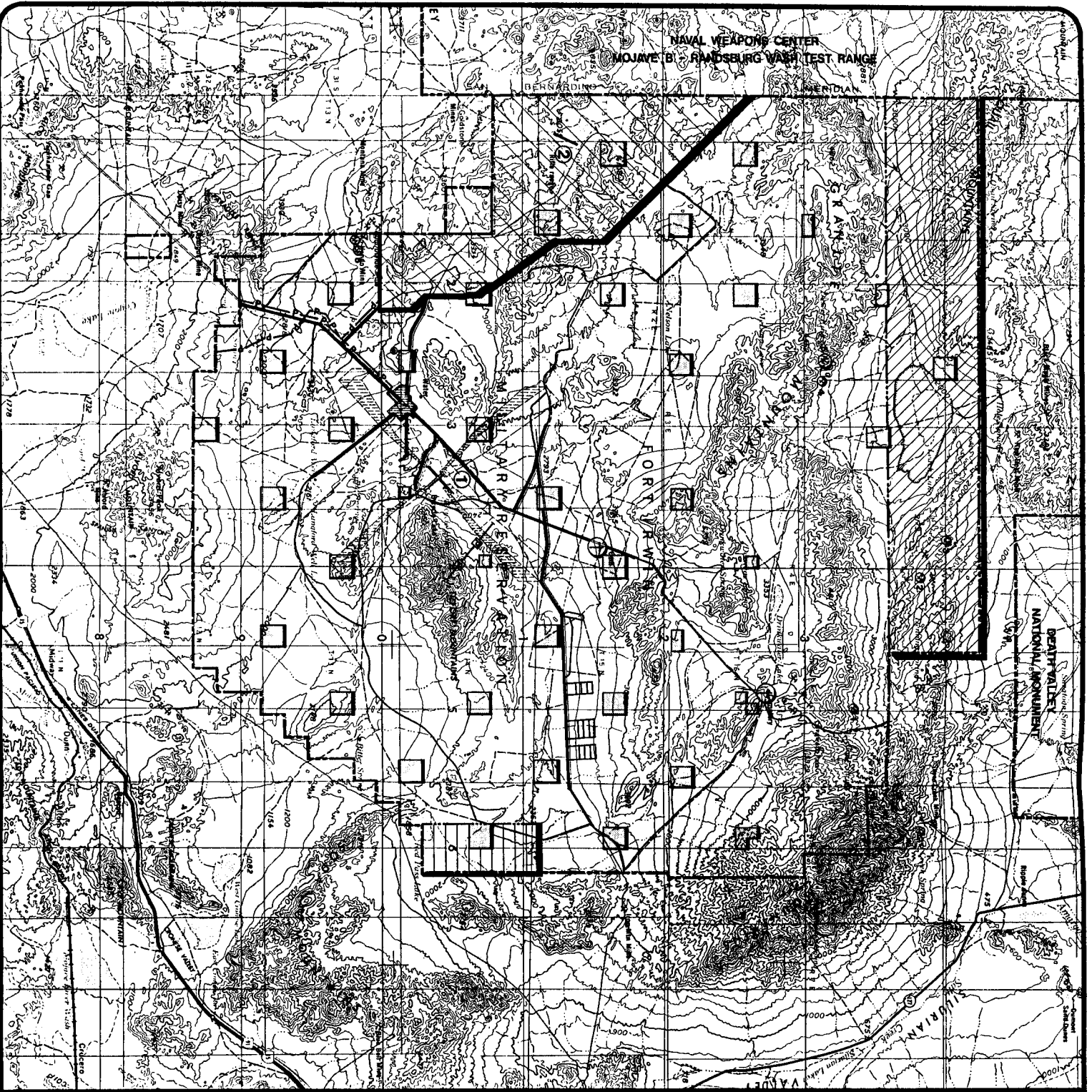
- o The Goldstone Deep Space Communications Complex occupies 67.3 square miles in the southwest portion of the reservation. The complex employs 485 people in National Aeronautics and Space Administration-related space communications programs. Electronic frequency interference from military warfare equipment used at Fort Irwin is a problem.
- o The Leach Lake Air to Ground Gunnery Range, a basin defined by the Granite Mountains, is used by the Air Force throughout the year for gunnery activities.
- o Two airfields, the Bicycle Lake Army Airfield and the Miller Airfield, are located on playas and are subject to intermittent flooding.



- o A 100-acre ammunition supply point containing 34 bunkers stores ammunition for training activities throughout the year.
- o Several lode mining claims, totaling 180 acres, exist on the base.
- o Ninety-nine-plus miles of asphalt roads and 45-plus miles of graded surfaces within the base connect the cantonment area with Barstow, the Goldstone Deep Space Center, the Bicycle Lake Airfield, and all outlying ranges and maneuver areas. From this network, an extensive system of cross-country trails and tracks has been created.
- o Electricity is transmitted from Southern California Edison via an aerial transmission line connecting the Pickering Road Substation (at Irwin Road and Pickering Road) with a post substation in the cantonment area. Generators supply power to the ranges when needed. Liquid propane used on the post is shipped by motor transport and stored in two 30,000-gallon tanks at the edge of the cantonment area.
- o Approximately 85 percent of the Fort Irwin Reservation is used for maneuvers, buffer safety zones and artillery impact areas. Restrictions exist only on National Aeronautics and Space Administration lands, live-fire impact areas, playas, and springs. Twenty-four basic firing ranges can accommodate all conventional weapons in the Army's current inventory. Figure 8 shows existing ranges and maneuver areas.
- o The cantonment area comprises 1,800 acres which contain administration, maintenance, and supply facilities; housing for 506 families, 1,002 single personnel; a 24-bed hospital; a grade school; and various recreational facilities. These are shown in Figure 9. Most of these facilities are currently unused.

#### C.        Airspace

The airspace over Fort Irwin is restricted from ground level to infinity. It is currently used by George Air Force Base for daily air-to-air and air-to-ground firing in the north end of the site; by NASA's Goldstone Tracking Station, which continuously operates radar; and by Army Reserve Components, mainly California Army National Guard, who use the remainder of the airspace on weekends and during summer training sessions. A supersonic air corridor passes over the northern portion of the reservation.



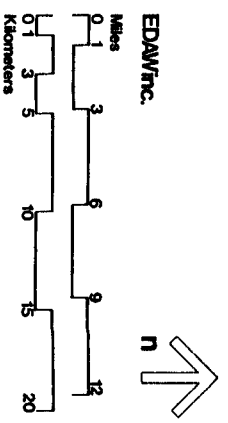
# Land Ownership and Infrastructure

FIGURE 7

- Cantonnement area
- Airfields
  - ① Bicycle Lake Army Airfield
  - ② Miller Airfield
- State lands
- NASA Goldstone
- Northrop
- Cemetery
- Mines  
(see text for explanation)
- Southern Calif. Edison Electrical R.O.W.
- NASA Electrical R.O.W.
- Air Force Gunnery Range
- Road
  - Primary (paved)
  - Tertiary (unpaved)
- Magazine area

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# Ranges and Maneuver Areas

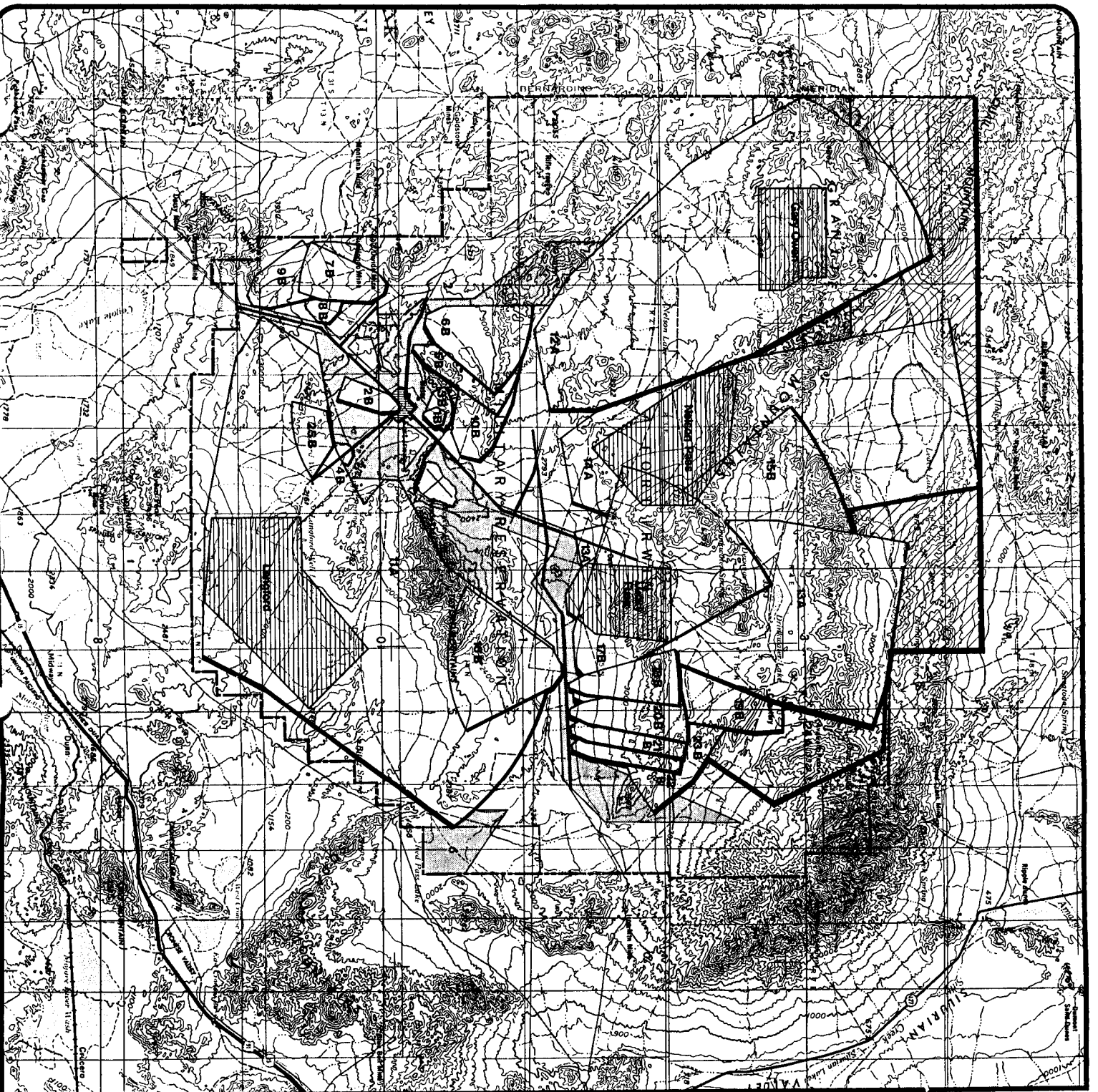
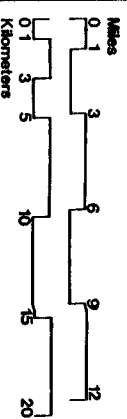
- 14A Fire/Maneuver area (see text for explanation)
- 6B Fixed point range (see text for explanation)
- Contiguous training and maneuver areas
- Cantonment area
- Paved road
- Impact zone - off limits
- Air Force gunnery range

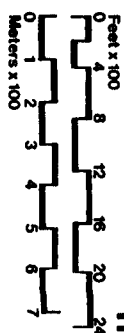
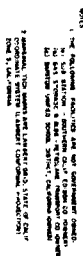
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#### D. Supply

Supplies and materials are generally received at Fort Irwin by: (1) commercial van; (2) railroad to the Barstow area and commercial or military vehicle to the base; or (3) priority shipment by commercial air service to Los Angeles and commercial or military transport to the base.

The only public entrance to Fort Irwin is through Barstow and over the 37-mile Irwin Road. This road is subject to closure during heavy rainstorms. A variety of unpaved desert trails enter the reservation from Bureau of Land Management lands. Rail sidings are at Mannix, West Yermo, and Barstow. There is no direct rail service to Fort Irwin.

#### 2.12.2 Periphery and Related Land Uses Within the Region

Figure 10 shows land uses in the Fort Irwin area.

- o The acreage around the north, east and south perimeter of Fort Irwin are public lands under the control of the Bureau of Land Management. Three categories of restrictive recreational use designations have been made on the lands.
- o Death Valley National Monument encompasses 2,067,832 acres. It is administered by the National Park Service and lies to the north of Fort Irwin. This unit of the National Park System had 646,287 visitors in 1977: 1,908,000 acres of the monument have been proposed as wilderness to the Congress by the Administration.
- o The Mojave "B" - Randsburg Wash Test Range complex, 487,308 acres, is part of the Naval Weapons Center located at China Lake west of Fort Irwin. The Center is involved with research and development, mainly with weapons systems for the Navy and Marine Corps.
- o East of Barstow is the United States Marine Corps Supply Center which distributes supplies to all Marine Corps elements west of the Mississippi.
- o Calico Ghost Town, northwest of Barstow, is a major park attraction, with 333,425 visitors in 1976.

#### 2.12.3 City of Barstow Land Use

The City of Barstow contains 13,316 acres (20.8 square miles) of land, including acreage in highway rights-of-way. More than 10,000 acres, or 75 percent, are vacant.

## 2.13 ECONOMIC CONDITIONS IN THE BARSTOW AREA

### 2.13.1 Economic Overview

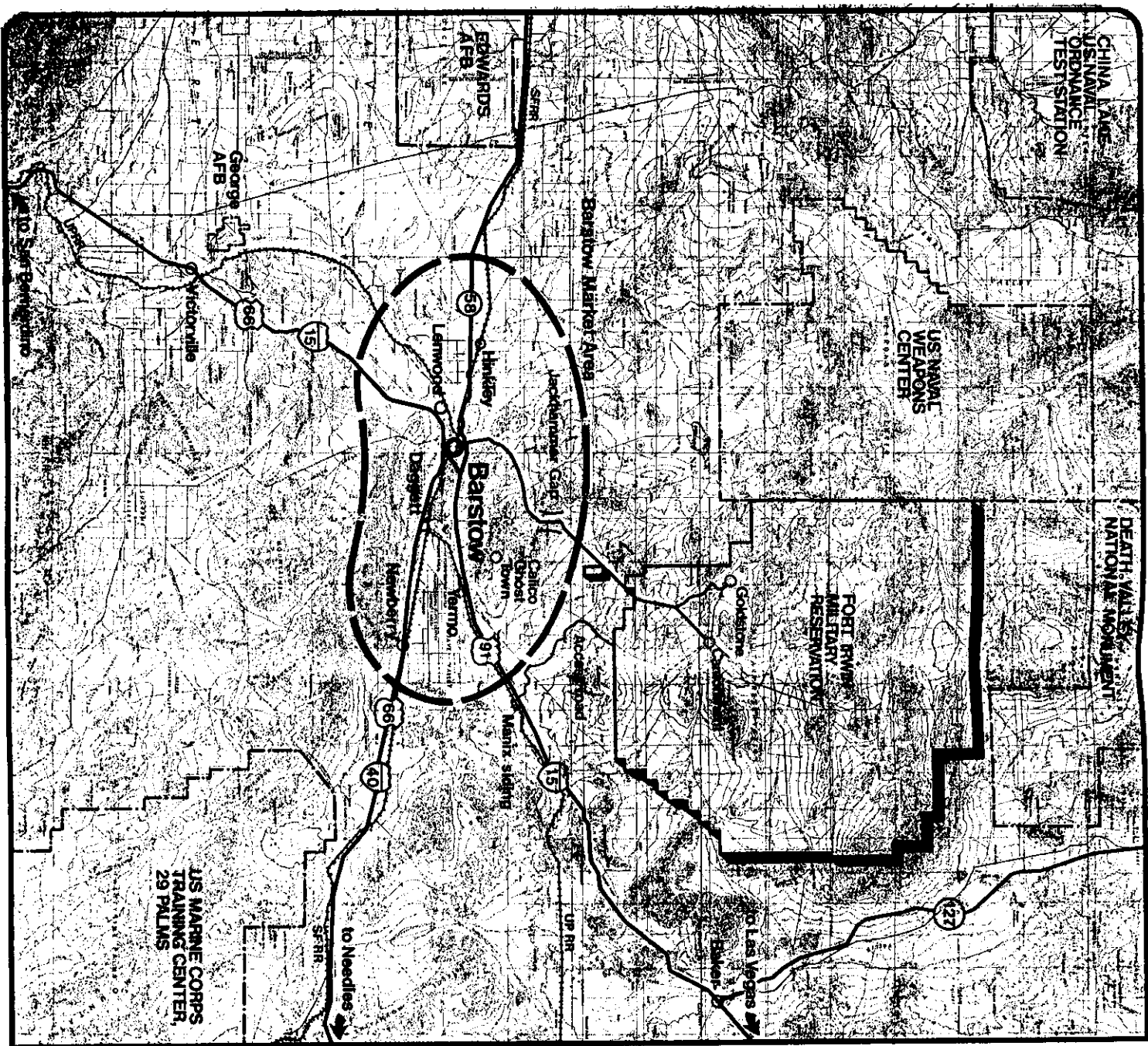
#### A. Regional Economy

The economy of the two county Riverside-San Bernardino Standard Metropolitan Statistical Area (SMSA) is historically founded on agriculture and currently represents a significant, but somewhat unstable, variety of economic activity. With a relative decline in agriculture in recent years, light manufacturing, distribution and service-related activities, especially government, have become dominant in the more populous county areas. Outdoor recreation, tourism and retirement are also significant factors in the regional economy.

The economy is now dominated by manufacturing and is anchored by the Kaiser Steel Complex. Mining is now second in economic importance to the region and includes the Eagle Mountain Iron Mine, the Colton-Victorville-Lucerne Valley limestone deposits, and the Mountain Pass rare earth deposits. Agriculture now ranks third in economic importance and consists of citrus groves, poultry raising operations, and beef and dairy operations. The Federal Government is the largest single employer in the two county area. Eight major Department of Defense installations are located in this area: Norton Air Force Base (San Bernardino), Marsh Air Force Base (Riverside), George Air Force Base (Victorville), Edwards Air Force Base (25 miles west of Barstow), China Lake U.S. Naval Ordnance Test Station (Ridgecrest), U.S. Naval Weapons Center (adjacent to western boundary of Fort Irwin), U.S. Marine Corps Training Center, 29 Palms (Twenty-Nine Palms), and U.S. Marine Corps Supply Depot (Barstow).

- (1) Population - After two decades (1950-1970) of rapid growth, population in the two-county - Standard Metropolitan Statistical Area, has stabilized in recent years.
- (2) Employment - Growth in employment in the combined Riverside and San Bernardino County area has followed, roughly, the same pattern as population growth and in some measure has been the cause of it.
- (3) Unemployment - Area unemployment rates from 1970 to 1975 fluctuated, with an overall increase from 7.3 percent to 11.4 percent. After record high unemployment levels in 1975, the 1977 level approximated that of 1974. Improvement in the unemployment situation is



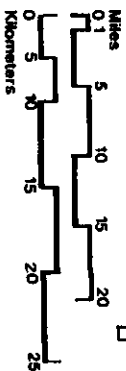


Region

Figure  
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expected to continue at a slower rate into 1978; however, the number unemployed is not expected to return to the pre-recession 30,000 range, because of a rapidly expanding labor force.

- (4) Construction - The years of 1974 and 1975 have been described as disastrous for the construction industry, and its employment situation during those years aptly supports the description. Unemployment rates for the construction industry exceeded 25 percent at the height of the recession and continue to fluctuate in the 10-20 percent range. This, together with high overall unemployment in San Bernardino County from 1974 to present, is both a reflection and cause of a migration away from the area.
- (5) Transportation/Public Utilities - The area's transportation industry is a small but viable sector, expanding by 1,500 jobs or approximately 17 percent over the past five years. About a third of the growth was generated by the railroads. In spite of a myriad of energy problems, growth is anticipated in utilities in 1978, since expansion of the Coolwater Edison plant will be completed, and construction of the proposed Lucerne Valley plant may be underway.

#### B. Barstow Area Economy

Historically, the economy of Barstow and surrounding areas is based on its strategic location and relative isolation as the paramount crossroads of the high desert. Its proximity to military training installations and supply centers has helped to stabilize its primary economic foundations. Major transportation, transshipment supply and distribution activities form the backbone of the Barstow economy, while the corresponding trade and service sectors, including the area function as a center for government administration, round out the employment picture.

- (1) Population - Barstow and surrounding communities have experienced a 12.8% population decline between 1970 and 1975, due to:
  - (a) The closing of Fort Irwin in 1971-72;
  - (b) The energy and recessionary impacts on transient business in the 1974-75 era;
  - (c) Gradual cutbacks in military employment requirements related to the US Marine Corps supply depot in 1971-75 period; and



- (d) Fertility rate reductions as a result of declines in natural birth rates and increase in the older retirement component of the population.
- (2) Employment - The interrelationship between population and employment is reflected in the service sector, as actual employment in the Barstow Unified School District and Community Hospital has substantially decreased since 1970.
- (3) Housing - Housing in the Barstow area has shown slow growth in recent years, except for major new activity in 1977. Low vacancy rates have led to inflating values. There is a high proportion of single-family units and a growing proportion of mobile homes.

2.14 GOVERNMENT, INSTITUTIONAL, AND SOCIAL CONDITIONS OF BARSTOW

2.14.1 Government

The City of Barstow is the dominant entity in the study influence area. The unincorporated communities of Hinkley, Daggett, Newberry Springs and Yermo, plus special districts, community service areas and San Bernardino County agencies also play a vital role in the area's governmental fabric.

2.14.2 Community Services

There are scores of private and public agencies providing community services in and around the Barstow area. Only the major services are briefly described below.

A. Health Facilities

The immediate Barstow area has a representative group of medical services including: one general hospital; one convalescent hospital; and one mental health clinic, plus such supporting services as five pharmacies, a clinical laboratory, and an ambulance service. There are 16 physicians and surgeons in private practice, eight dentists, three optometrists and seven chiropractors with offices in Barstow.

San Bernardino County operates a community clinic with a full range of medical care on an outpatient basis with a staff of four physicians and other support personnel. The county's Health Care Services Agency operates a clinic in Barstow for nursing services, physical therapy, and social work consultation. In addition to the Rimrock Villa Convalescent Hospital, there is a small boarding home (capacity, 10) in Grandview.

## B. Education

Major educational agencies are the Barstow Unified School District and the Barstow Community College.

The Barstow Unified School District reported an enrollment of 8,017 students as of April 15, 1977. This represents a considerable and continuing decline from recent peaks of approximately 11,000 students. Because of the expected continuing enrollment decline, the district is consolidating and closing some schools.

The Barstow Community College, funded basically by state and local revenue sources, had enrollment in 1975-76 of 1,400. This enrollment, down from a peak of 2,000 in the previous year, includes equal numbers of nighttime, full-time and veteran students.

Private schools in the area include Barstow Christian, Mount St. Joseph's, and Seventh Day Adventist School.

## C. Parks and Recreation

The Barstow Park and Recreation District is a separate special district covering more than 400 square miles of the Barstow area. Deficient in several aspects of developed recreation space, the District has a plan which includes major additions.

## D. Other Cultural Facilities and Activities

The Community Resources Directory sponsored by the Barstow Area Human Services Council depicts an active social exchange in the area. In addition, the City is proposing to build a 600-seat performing arts center near the existing civic center.

## E. Public Safety

Barstow has its own police department with 35 personnel and 11 patrol cars. The San Bernardino County Sheriff's Department patrols the unincorporated areas, and the California Highway Patrol covers the considerable traffic activity through the area. Because of the extensive military and transient force presence, the FBI also has an office in Barstow.

## F. Fire Protection

The Barstow Fire District covers 31 square miles and approximately 26,000 people, including Barstow and the unincorporated populated areas in and around the city.

In 1977, the district had 19 full-time personnel and 48 volunteers. The district has four pumpers, one main station and three substations, plus a paramedic unit. A proposed 16,000 square foot facility is expected to be completed before October, 1978.

The Barstow area also includes volunteer fire districts in Hinkley, Yermo, Daggett and Newberry.

#### G. Transportation

The City of Barstow is an important transportation hub for railroads, trucks and passenger vehicles. The Union Pacific and Santa Fe Railroads both pass through Barstow. In addition, a Southern Pacific line passes through the High Desert region to the south and west of Barstow.

Interstate Route 15 carries more than 6.5 million vehicles per year through Barstow. It is estimated that 43 percent of this traffic originates in or has a destination of Las Vegas.

#### H. Airport

The Barstow Daggett Airport, east of Barstow is capable of general utility air service to the Barstow area. The airport is operated by the San Bernardino County Department of Airports and its longest runway is 6,400 feet.

#### I. Barstow Proposed Redevelopment

The City of Barstow is proposing several redevelopment projects, totaling over nine million dollars. These include projects for housing, commercial development, and public improvements such as circulation, water, and street lighting.

#### 2.14.3 Public Finance

In general, the City of Barstow appears to be in good fiscal health. Its major concern is the heavy reliance on military and government spending for its economic base. It is also dependent on automobile tourism through the desert and particularly to Las Vegas. Its budget draws considerably on state and federal support. Its present budget also calls for a large dip into prior year surpluses. However, recent development activities such as the Barstow Mall, the Santa Fe Yard, the Coolwater Plant and increasing residential projects appear to signal a healthy stimulus to the city and surrounding area.

The County of San Bernardino is so extensive and diverse that its finances are not directly relevant to the study without considerable manipulations.

#### 2.14.4 Infrastructure - Water and Sewer Facilities

Water and sewer facilities and activities in the Barstow area appear to be in a state of flux, with differences of opinion by experts and agencies on causes and solutions. Studies are now continuing and some important decisions may be made during the next few months.

The Barstow City Manager has announced a plan for a 15-mile pipeline to carry water from the Mojave River at Helendale to Lenwood. The project is expected to assure Barstow's water needs through the year 2000. According to the preliminary report, Barstow will be out of water in 10 years if present consumption and supply conditions persist. The \$5 million project could be completed in seven years and would be considerably less expensive than constructing a pipeline to the California Aqueduct at Hesperia -- another often mentioned alternative.

The second major issue in the area in addition to water supply is water quality. Just as there are differences of opinion about the future of the groundwater supply, there are also differences about the so-called Barstow slug, which is a colorful, almost pungent term for the presence of very poor quality groundwater in the area. Both issues concern the cost and responsibility for selecting alternative solutions.

The Comprehensive Water and Sewage Plan, prepared for the County of San Bernardino and the Mountain Desert Planning Agency in April, 1972, examined 13 regions in the county. The report notes the generally unplanned heavy reliance on groundwater supplies in most of the desert region, and the future need for supplemental water supplies, typically from the California Aqueduct.

There are three wastewater collection and disposal systems other than private subsurface disposal facilities in the Barstow region. These are: City of Barstow, Barstow-Daggett Airport, and U.S. Marine Corps Supply Center.

In 1972, the City of Barstow had only 3,000 of its 12,800 acres served by the sewer system. Of the 5,000 sewer service connections, 85 percent were residential. The treatment plant, built in 1953, consists of primary clarification followed by oxidation ponds. In 1968, the plant was expanded to its present capacity of 4.5 million gallons per day. Average metered flow in 1969 was 1.2 million gallons per day.

The Barstow-Daggett Airport system was designed in 1943 for a population of 1,500 and was serving 150 people in 1972. The sewerage facilities consist of lagoons from which the wastewater is disposed of by evaporation and percolation. Average flow was 12,000 gpd against a capacity of 150,000 mgd.

The U.S. Marine Corps Supply Center has facilities at Yermo and Nebo to serve 5,533 personnel. Both facilities provide primary and secondary treatment. The average sanitary wastewater flow from Yermo was 125,000 gallons per day in 1969 versus a capacity of 500,000; and from Nebo, 427,000 gallons per day versus 800,000 gallon daily capacity.

The Barstow Capital Improvement Program (CIP) includes several proposed water and sewer projects. Most of the projects have been long recommended by the city in anticipation of future expansion in the area.

## 2.15 AESTHETIC QUALITIES

The Bureau of Land Management has labeled the Avawatz Mountains an area of "prime" scenic quality based on its landscape features and their visual characteristics, the extent of modification by human intrusion, and the uniqueness of these features within the region. The remainder of Fort Irwin can be considered on a regional basis as "common" in scenic quality.

Fort Irwin, for all practical purposes, cannot be viewed by the general public. Hence, the post could be considered low in visual sensitivity. One exception to this is those lands on the north and east sides of the Avawatz Mountains within the viewshed of Death Valley National Monument and Route 127, a major entrance road to it. These lands could be considered of high sensitivity, as a large percentage of traffic on Route 127 is traveling to or from the Monument and hence has a major recreational concern for the scenic qualities of the area.